

Evaluation of sexual function following bipolar vaporization versus monopolar transurethral resection of the prostate

Original
Article

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ABSTRACT

Background: Little light has been shed on erectile functions following bipolar vaporization of the prostate.

Patients and Methods: A prospective study was conducted that included 100 cases with a history of endoscopic prostatic surgery. Cases were allocated into two groups: group I included 50 patients who were subjected to the conventional monopolar transurethral resection of the prostate (TURP), and group II included 50 patients who were subjected to bipolar vaporization of the prostate. All patient were assessed 3 and 6 months after the operation. Severity of benign prostatic hypertrophy symptoms and erectile function were reassessed using International Prostate Symptom Score and International Index of Erectile Function-5 (IIEF-5), respectively.

Results: Although all patients in both groups demonstrated significantly lower IIEF-5 scores 3 months postoperatively ($P < 0.0001$), the percentage of IIEF-5 score reduction was insignificantly different between both groups. No significant differences were found at the 6-month follow-up. The erectile fraction (EF) in group II (bipolar vaporization group) was slightly better, yet insignificantly different from group I. The incidence of complications (TURP syndrome, bladder perforation, intraoperative bleeding, postoperative bleeding, and postoperative urinary tract infection) in group I (monopolar TURP) was significantly higher than the incidence in group II (bipolar vaporization). Among the study variables, it seems that diabetes mellitus and hypertension and development of postoperative complications (especially intraoperative bleeding, capsular perforation, and urinary tract infection) were significantly associated with development of postoperative erectile dysfunction (ED).

Conclusion: No significant difference was found regarding sexual function following monopolar TURP and the bipolar vaporization of the prostate. However, the bipolar TURP is safer with less complications.

Key Words: Bipolar vaporization, erection, lower urinary tract symptom, prostate, transurethral resection of the prostate

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INTRODUCTION

Benign prostatic hyperplasia (BPH) is a frequently reported problem among the elderly. Despite being benign, it badly affects the patient's quality of life with the frequently encountered symptoms of the lower urinary tract and the hindered sexual functions, mainly erection and ejaculation^[1,2].

Although transurethral resection of the prostate (TURP) remained the main therapeutic option for lower urinary tract symptoms (LUTS) which results from bladder outlet obstruction for long time, its high morbidity rate encouraged the search for safer and less invasive therapeutic options such as laser-based techniques^[3,4].

The development of bipolar vaporization and resection systems is a great achievement in this field and is considered to be much safer than the older maneuver, that is, monopolar TURP^[5]. It is based on the well-known electrical principles of

the transurethral high-frequency surgery^[6].

There is controversy about the exact effect of different TURP techniques on the patient's sexual function. TURP usually improves the LUTS; however, there is scarcity in literature regarding the ability of TURP to improve the impaired sexual function, and to the best of our knowledge, factors predicting the improvement of sexual function following TURP are not clear. Moreover, the studies comparing the patient's erectile functions following the bipolar TURP and the monopolar TURP are scarce. That is why, the current study investigated the effect of monopolar TURP and bipolar vaporization on the patient's sexual functions. It also evaluated the possible prognostic factors, good and poor, for the sexual function following TURP.

PATIENTS AND METHODS

Study design

A prospective study was performed in the Urology

Department, Benha University Hospital and Alagouza Hospital on 100 patients with BPH who signed an informed written consent, elaborating the aim, methods, anticipated benefits, and potential hazards, before joining the study, which was approved by the scientific research ethics committee of Benha Faculty of Medicine.

Inclusion criteria were BPH resistant to medications (excluding those on 5-alpha reductase inhibitors and/or phosphodiesterase inhibitor type 5), scoring more than 9 on the International Prostate Symptom Score (IPSS), peak urinary flow rate (Qmax) less than 10 ml/s, BPH-induced urine retention, the total prostate size is 30–60g on ultrasound (abdominal unless TRUS is indicated), and being sexually active for at least 6 months before surgery.

Exclusion criteria were poorly controlled diabetes; history of cerebrovascular stroke, Parkinson disease, and bladder cancer in the last 2 years; other causes of LUTS such as cystitis, urethral stricture, and cancer prostate; abnormal penile duplex (peak systolic velocity <15 cm/s, which indicates severe arterial disease; and persistent end diastolic velocity (EDV) >5 cm/s, which suggests venous leak).

Baseline preoperative evaluation

In the baseline preoperative visit, each patient was subjected to a thorough history taking and was assigned a score demonstrating the severity of the BPH according to the IPSS^[7,8]. Erectile functions were evaluated using a self-administered questionnaire as well as the International Index of Erectile Function-5 (IIEF-5), which includes five categories: severe (5–7), moderate (8–11), mild to moderate (12–16), mild (17–21), and no ED (22–25)^[9,10]. Patients also were subjected to clinical genital examination including digital rectal examination, pelvi-abdominal ultrasound with calculation of postvoiding residual, and penile duplex.

Preoperative laboratory tests included liver and kidney function tests, complete blood picture, bleeding profile, glycated hemoglobin, hormonal profile (testosterone and prolactin), and prostatic-specific antigen.

Surgical procedures

Cases were allocated into two groups: group I included 50 cases that were subjected to the conventional monopolar TURP (Nesbit technique), and group II included 50 cases that were subjected to plasma kinetic vaporization of the prostate using a Storz or Olympus Fr26 (Olympus Shinjuku Monolith, 3-1 Nishi-Shinjuku 2-chome, Shinjuku-ku, Tokyo 163-0914, Japan KARL STORZ SE & Co. KG Dr.-Karl-Storz-Straße 3478532 Tuttlingen

Germany continuous flow resectoscope with plasma kinetic electrode using bipolar current.

Postoperative evaluation and follow-up

At 3 and 6 months after the operation, severity of BPH symptoms and erectile function were reassessed using IPSS and IIEF-5, respectively.

Statistical methods

IBM SPSS Statistics, version 23 (IBM Corp., Armonk, New York, USA) was used for data analysis. The unpaired t test was used to compare the intergroup differences of continuous numerical variables presented as mean \pm SD. The Pearson χ^2 test or Fisher's exact test was used appropriately to compare categorical variables presented as number and percentage. The χ^2 test was used for ordinal data and trend identification. The linear mixed model detected the changes in IIEF. Significance level was set at *P* values less than 0.05.

RESULTS

According to OpenEpi, the sample size was set at 100 patients (50/group) with confidence level 95% and the power of the test of 80%.

A simple randomization method (shuffled cards) was concealed and applied by independent registered nurses, and the outcome assessor was not aware of the type of operation performed on each patient.

The 100 patients were examined for inclusion criteria of this study. Based upon the exclusion criteria, 16 patients were excluded. Moreover, nine patients did not complete the follow-up visits, which were determined in the study protocol. At the end, 75 patients only completed the study (Fig.1).

Baseline preoperative evaluation

Patients' mean age was 65.2 \pm 5 years, with no insignificant difference between both study groups regarding age, prostate size, and IPSS. The IIEF scores in group I were 22.21 \pm 0.4 and in group II were 22.46 \pm 0.6, without significant difference (*P* =0.4) (Table 1).

Postoperative outcome

Urinary symptoms

Urinary symptoms were significantly improved in both treatment groups following the intervention (*P* <0.0001); however, the percentage of clinical improvement was insignificantly different between both groups (Table 2).

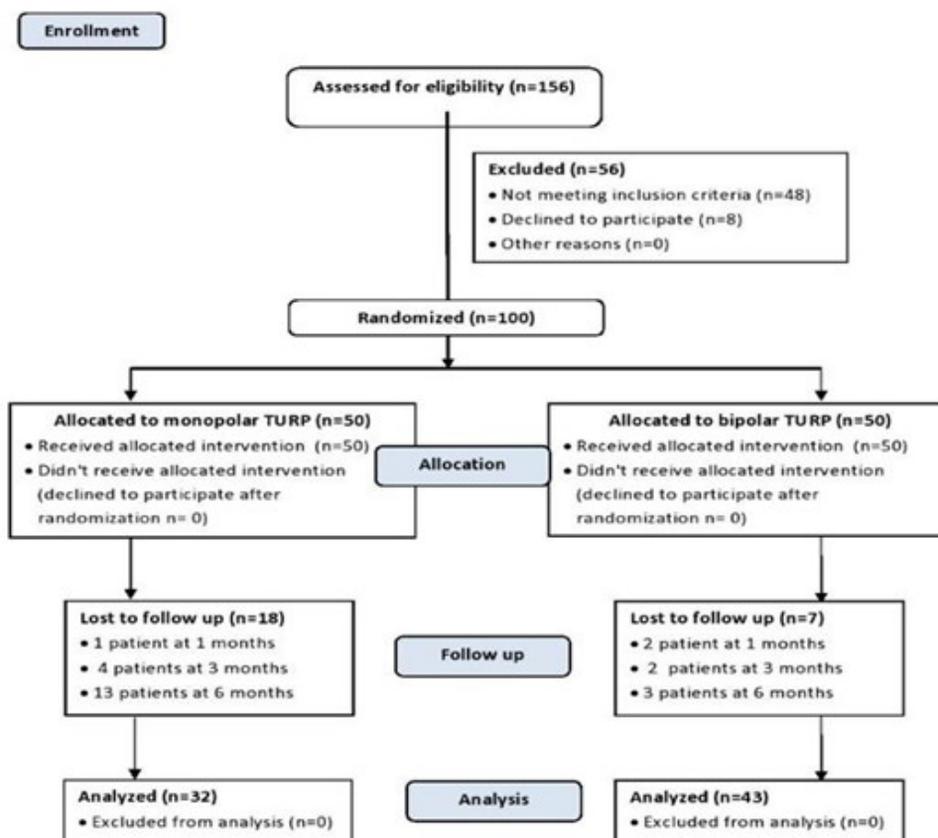


Fig. 1: Flow chart.

Table 1: The baseline preoperative clinical findings in the two treatment groups

Variables	Group I monopolar TURP (N=32)	Group II bipolar vaporization (N=43)	<i>P</i> value
Age (years)	65.12±4.9	65.1±5.1	0.9
Prostate size (ml)	55.56±4.8	53.7±6.4	0.17
Preoperative IPSS	27.15±4.6	26.8±4.8	0.75
Preoperative IIEF	22.21±0.4	22.46±0.6	0.4

Data are mean ±SD.

IIEF, International Index of Erectile Function; IPSS, International Prostate Symptom Score; TURP, transurethral resection of the prostate.

Table 2: Change in urinary symptoms in both study groups

Treatment groups	IPSS scores			
	Preoperative	After 3 months	<i>P1</i> value	% of IPSS reduction
All patients (N=75)	26.9±4.7	6.8±3.4	<0.0001	74.70±12.12
Group I: monopolar TURP (N=32)	27.15±4.6	6.4±3.6	<0.0001	77.4±10.8
Group II: bipolar vaporization (N=43)	26.8±4.8	7.1±3.2	<0.0001	72.7±12.7
<i>P3</i> value	0.8	0.37	–	0.09

Data are mean ±SD.

IPSS, International Prostate Symptom Score; TURP, transurethral resection of the prostate.

P1: difference between preoperative and 3 months postoperative IPSS scores.

P3: difference between both groups.

Erectile function

Patients in both groups reported significant reduction in IIEF-5 scores 3 months postoperatively ($P<0.0001$); however, the percentage of IIEF-5 score reduction was insignificantly different between both groups. At the 6-month follow-up visit, IIEF-5 scores did not show any significant difference from the scores reported at 3-month visit following the intervention (Table 3).

A total of 16 (50%) patients of the 32 patients who underwent monopolar TURP did not develop ED following surgery (IIEF-5 scores=22–25), whereas 11 (34.37%) patients of them developed mild ED (IIEF scores=17–21) and five only (16.62) developed mild to moderate ED (IIEF scores=12–16).

Of the 43 patients who underwent bipolar vaporization, sexual function was preserved in 27 (62.7%) patients;

however, 14 (32.5%) patients developed mild ED and two (4.6%) patients only developed mild to moderate ED. The EF in group II (bipolar vaporization group) was slightly better, but the difference between the two groups was insignificant.

Receiver operating characteristic curve was applied to predict the improved sexual function using preoperative IIEF score. Preoperative IIEF score had fair-to-good predictive value. Area under the receiver operating characteristic curve was 0.771, with SE=0.041, 95% confidence interval (CI)=0.660–0.860, and *P* value less than 0.0001. The best cutoff for IIEF score was more than 22, with sensitivity of 57.1% (95% CI=41.0–72.3%), specificity of 97% (95% CI=84.2–99.9%), positive predictive value of 96% (95% CI=77.4–99.4%), and negative predictive value of 64% (95% CI=55.5–71.7%) (Fig.2).

Table 3: Preoperative and postoperative erectile function in both study groups

Treatment groups	IIEF scores					
	Preoperative	After 3 months	<i>P1</i> value	% of IIEF after 3 months	After 6 months	<i>P2</i> value
All patients (N=75)	22.36±0.5	20.7±2.4	<0.0001*	6.9±11.15	21.12±2.6	0.3
Group I: monopolar TURP (N=32)	22.21±0.4	20.43±2.9	0.001*	7.8±13.14	20.8±3.2	0.51
Group II: bipolar vaporization (N=43)	22.46±0.6	21.02±2.01	<0.0001*	6.3±9.5	21.3±2.3	0.31
<i>P3</i> value	0.4	0.3	–	0.57	0.62	–

Data are mean ±SD.

IIEF, International Index of Erectile Function; TURP, transurethral resection of the prostate.

*Unpaired ttest.

P1: difference between preoperative and 3 months postoperative IIEF scores.

P2: difference between 3-month and 6-month post-operative IIEF scores.

P3: difference between both groups.

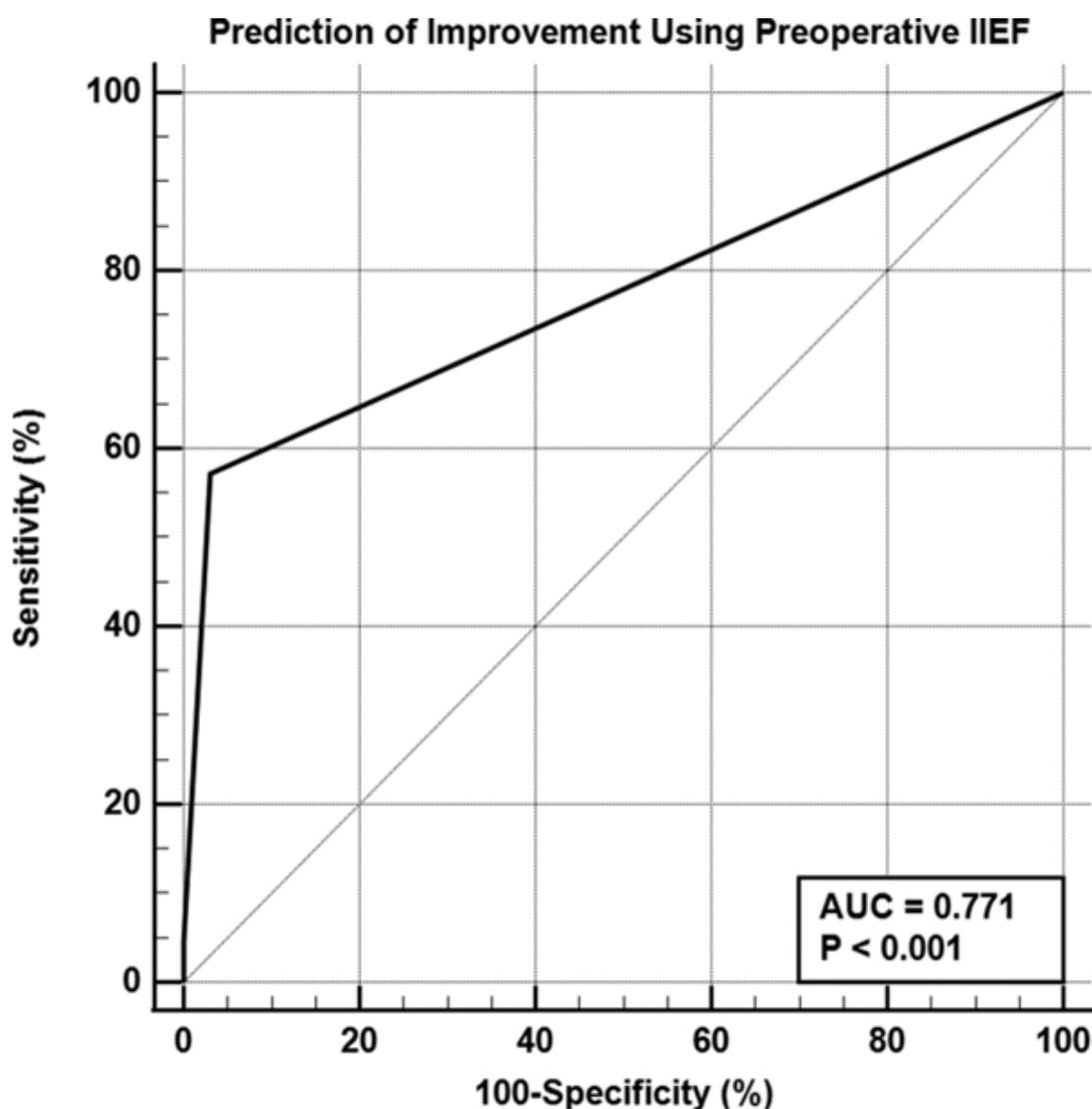


Fig. 2: Receiver operating characteristic (ROC) curve for prediction of improved sexual function using preoperative IIEF score. IIEF, International Index of Erectile Function.

Safety of the procedures

Regarding the operation safety, the incidence of complications [TURP syndrome, bladder perforation, intraoperative bleeding, postoperative bleeding, and postoperative urinary tract infection (UTI)] in group I (monopolar TURP) was significantly higher than the

incidence in group II (bipolar vaporization) (Table 4).

Among the study variables, it seems that diabetes mellitus and hypertension and development of postoperative complications (especially intraoperative bleeding, capsular perforation, and UTI) were significantly associated with development of postoperative ED (Table 5).

Table 4: Incidence of adverse outcomes in both study groups

Adverse outcome	Group I: monopolar TURP (N=32)	Group II: bipolar vaporization (N=43)	P value
TURP syndrome	1 (3.125)	0	<0.0001
Bladder perforation	2 (6.25)	2 (4.65)	<0.0001
Intraoperative bleeding	3 (9.375)	3 (6.97)	<0.0001
Postoperative bleeding	4 (12.5)	3 (6.97)	<0.0001
Postoperative UTI	8 (25)	6 (13.95)	<0.0001

Data are n (%).

TURP, transurethral resection of the prostate, UTI, urinary tract infection.

Table 5: Factors affecting the changes in sexual function following the operation

The study variables	Patients who developed ED (N=32)	Patients who didnot develop ED (N=43)	P
Age	66.03±4.7	64.5±5.1	0.21
Baseline prostate size	53.7±6.4	55.1±5.4	0.3
Baseline IPSS	27.6±4.3	26.4±4.9	0.27
Baseline IIFE	22.4±0.5	22.3±0.5	0.39
% of IPSS reduction	75.47±13.04	74.1±11.5	0.36
Associated comorbidities (DM, HTN)	16 (50)	19 (44.18)	<0.0001
Intraoperative bleeding	4 (12.5)	2 (4.6)	<0.0001
Capsular perforation	2 (6.25)	2 (4.6)	<0.0001
Postoperative UTI	10 (31.25)	4 (9.3)	<0.0001

Data are mean ±SD and n (%).

DM, diabetes mellitus; HTN, hypertension; IPSS, International Prostate Symptom Score; UTI, urinary tract infection.

DISCUSSION

Erection and/or ejaculation disorders have been strongly associated with BPH and suggested to be a result of a disrupted nitric oxide-cyclic guanosine monophosphate pathway, an enhanced RhoA-Rho-kinase contractile signaling, a hyperactivity of the autonomic adrenergic signaling, or an atherosclerosis of the pelvic blood vessels^[11,12].

Management of BPH guidelines includes general instructions, medical treatment, and surgical TURP. Monopolar TURP was considered as the standard treatment, especially for those who didnot respond well to medical treatment and for those who ask for active treatment. Bipolar TURP is an equivalent effective alternative, yet safer with interoperative and postoperative hazards^[13].

The current results showed that the bipolar vaporization is significantly safer with better outcomes than the monopolar TURP, which caused significantly more adverse effects. This is in agreement with Geavlete *et al.*^[14], who reported that 1.8% of their patients in the TURP group experienced TURP syndrome, whereas none of the TURP is patients group had the serious syndrome. However, Otaola-Arca *et al.*^[15] couldnot detect any significant difference in their prospective randomized study regarding the efficacy nor the safety of the monopolar TURP and the bipolar plasmakinetic TURP as a therapeutic intervention for BPH.

The effect of TURP on erectile function is an area of debate. There is lack of knowledge of the exact mechanisms of sexual affection following treating LUTS owing to BPH surgically. Many studies discussing this point are available

in literature, in which TURP may improve, deteriorate, or not affect sexual function^[16].

This study demonstrated a significantly low overall IIEF score in the whole sample, denoting a significantly deteriorated postoperative sexual function. Although TURP is generally considered a safe procedure, an incidence of post-TURP erectile dysfunction ranging between 4 and 40% has been reported in most of the published literature, and the varying rates have been owed to the different methods of assessment of EF and the different length of follow-up periods^[17]. Tscholl *et al.*^[18] reported that the development of temporary erectile dysfunction was seen in a significant proportion of their patients for 2–3 months following TURP. This could be expected due to the postoperative pain and stress. Moreover, Liu *et al.*^[19] reported a slight deterioration in sexual function (mild decline in postoperative IIEF-5 scores); however, their study sample was already suffering from ED before the surgery. The mechanism by which TURP may induce ED is not clear yet. The possible explanations include direct thermal/chemical erectile nerve injury, psychological impact of the intervention^[20], injury of the cavernous nerve, cavernous arteries fibrosis or thrombosis, corpora cavernosa fibrosis, and venous leakage^[17].

On the contrary, Li *et al.*^[21] reported that in patients with BPH with normal baseline erectile function, TURP may improve the IIEF-5 scores over 1 year of follow-up. This improvement was associated with the significant improvement in urinary symptoms. Pavone *et al.*^[22] also reported postoperative improvement of EF in 16.2% of their sample following TURP. This improvement in the erectile function following TURP might be related

to the relief of the obstructive urinary symptoms caused by BPH. Relief of LUTS is strongly correlated with the improvement in erectile function; this relief is produced by either surgical intervention or medical treatment, for example, alpha-blocker treatment^[23].

The relatively alternative procedure to regular monopolar TURP, the bipolar TURP, was introduced as a safer operation; however, cutting the tissue using the bipolar system needs a very high electrical power to generate plasma, leading to massive heat production with the possible subsequent thermal tissue injury^[24].

In the current work, there was an insignificant difference between both groups regarding the changes in IIEF-5 scores and the distribution of ED following the maneuver. Few prospective studies reported insignificantly different outcomes regarding sexual function following bipolar TURP and monopolar TURP^[20,25–27]. Most of the available RCT-based meta-analyses regarding this issue either did not mention bipolar vaporization or touched it roughly. This might be because of the relatively more recent evidence of the better safety profile of bipolar vaporization and its possible effect on sexual function^[5].

In the present work, there was an insignificant difference in the clinical findings between the patients who developed postoperative ED and those in whom erectile function was preserved. However, the presence of associated comorbidities (diabetes mellitus and hypertension) as well as the development of complications (especially intraoperative bleeding, capsular perforation and UTI) were significantly more common in the group of postoperative ED. This comes in agreement with the study by El Shorbagy *et al.*^[28].

Mamoulakis *et al.*^[20] stated that patients with higher preoperative IIEF/EF scores had a lower probability of deterioration of erectile function, and those with severe ED at baseline visit had a higher chance of improvement following the operation. In addition, it was suggested that patients with more severe preoperative urinary symptoms may have a higher chance to develop EF improvement after the operation owing to the amelioration of LUTS^[29].

Improving urinary symptoms associated with BPH is a priority for most of the patients; however, the effect of the used therapeutic option on the erectile function of the patient is one of the main concerns. Despite the great importance of this issue, there are no well-established data about the exact effect of different BPH therapeutic options on the erectile function of the patient, and the factors suggesting improvement or deterioration of sexual function following the operation. Considering the conflicting variable findings in literature, and our limited number of cases with a large number of patients who were lost to follow-up, more prospective comparative studies with a large sample size and long-term follow-up are needed to elucidate this mystery.

CONCLUSION

Bipolar vaporization of the prostate has many advantages over monopolar TURP regarding safety and incidence of complications; however, no significant differences were found regarding sexual function between both techniques.

CONFLICT OF INTEREST

There are no conflicts of interest.

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